

# FDP18N20F / FDPF18N20F

## N-Channel MOSFET, FRFET

200V, 18A, 0.145Ω

### Features

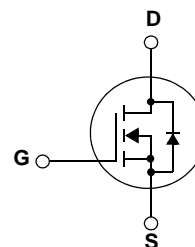
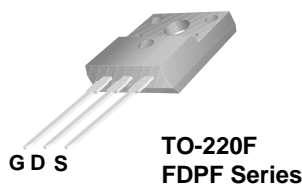
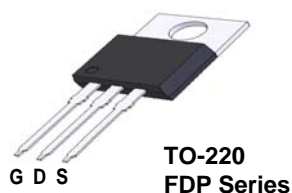
- $R_{DS(on)} = 0.12\Omega$  (Typ.) @  $V_{GS} = 10V$ ,  $I_D = 9A$
- Low gate charge (Typ. 20nC)
- Low  $C_{rss}$  (Typ. 24pF)
- Fast switching
- 100% avalanche tested
- Improve dv/dt capability
- RoHS compliant



### Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficient switching mode power supplies and active power factor correction.



### MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	FDP18N20F	FDPF18N20F	Units
$V_{DSS}$	Drain to Source Voltage	200		V
$V_{GSS}$	Gate to Source Voltage	$\pm 30$		V
$I_D$	Drain Current	-Continuous ( $T_C = 25^\circ\text{C}$ )	18	A
		-Continuous ( $T_C = 100^\circ\text{C}$ )	10.8	
$I_{DM}$	Drain Current	- Pulsed (Note 1)	72	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	324		mJ
$I_{AR}$	Avalanche Current (Note 1)	18		A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	10		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	100	W
		- Derate above $25^\circ\text{C}$	0.83	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150		$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300		$^\circ\text{C}$

\*Drain current limited by maximum junction temperature

### Thermal Characteristics

Symbol	Parameter	FDP18N20F	FDPF18N20F	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.2	3.6	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case to Sink Typ.	0.5	-	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	62.5	

**Package Marking and Ordering Information**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP18N20F	FDP18N20F	TO-220	-	-	50
FDPF18N20F	FDPF18N20F	TO-220F	-	-	50

**Electrical Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$ , $T_J = 25^\circ\text{C}$	200	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.2	-	$V/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 200\text{V}$ , $V_{GS} = 0\text{V}$	-	-	10	$\mu\text{A}$
		$V_{DS} = 160\text{V}$ , $T_C = 125^\circ\text{C}$	-	-	100	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 30\text{V}$ , $V_{DS} = 0\text{V}$	-	-	$\pm 100$	nA

**On Characteristics**

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}$ , $I_D = 9\text{A}$	-	0.12	0.145	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 20\text{V}$ , $I_D = 9\text{A}$ (Note 4)	-	13.6	-	S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	885	1180	pF
$C_{oss}$	Output Capacitance		-	200	270	pF
$C_{rss}$	Reverse Transfer Capacitance		-	24	35	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 160\text{V}$ , $I_D = 18\text{A}$ $V_{GS} = 10\text{V}$ (Note 4, 5)	-	20	26	nC
$Q_{gs}$	Gate to Source Gate Charge		-	5	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	9	-	nC

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 100\text{V}$ , $I_D = 18\text{A}$ $R_G = 25\Omega$ (Note 4, 5)	-	16	40	ns
$t_r$	Turn-On Rise Time		-	50	110	ns
$t_{d(off)}$	Turn-Off Delay Time		-	50	110	ns
$t_f$	Turn-Off Fall Time		-	40	90	ns

**Drain-Source Diode Characteristics**

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	18	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	72	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 18A	-	-	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 18A dI <sub>F</sub> /dt = 100A/μs (Note 4)	-	80	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	240	-	nC

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 2\text{mH}$ ,  $I_{AS} = 18\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 18\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

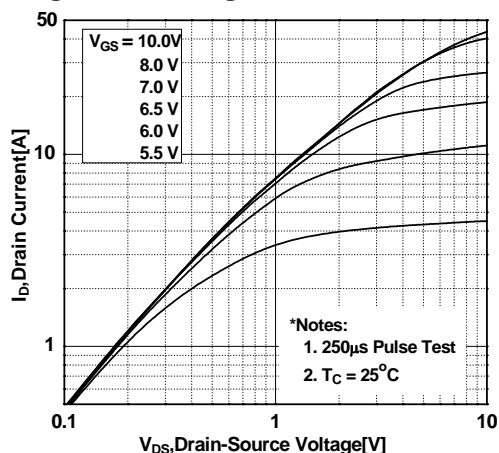


Figure 2. Transfer Characteristics

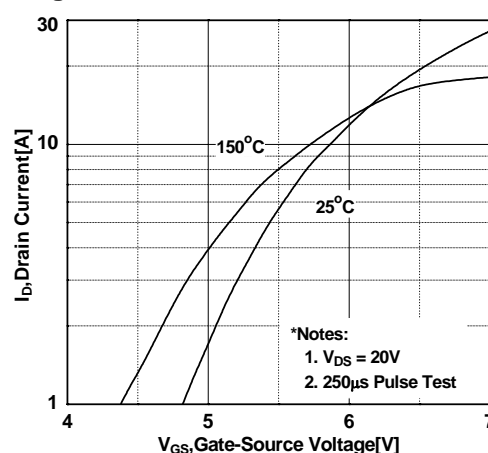


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

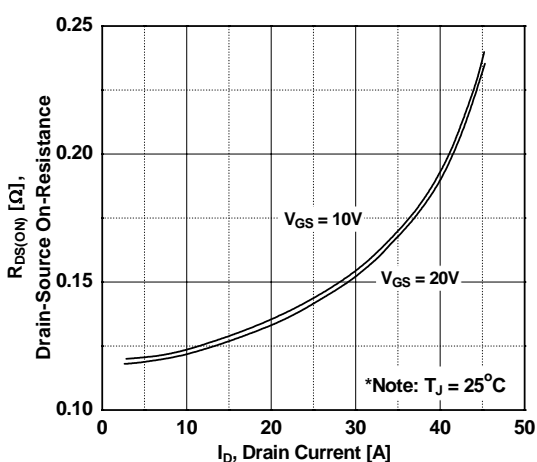


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

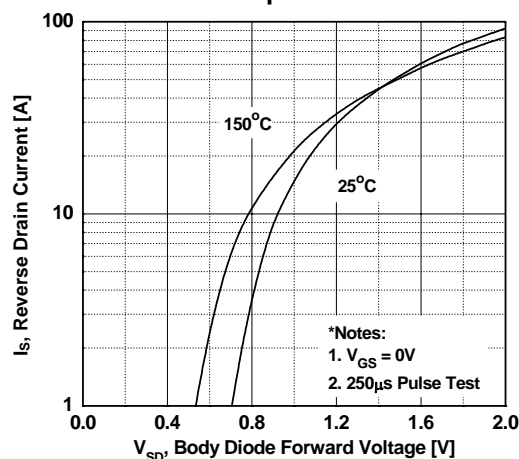


Figure 5. Capacitance Characteristics

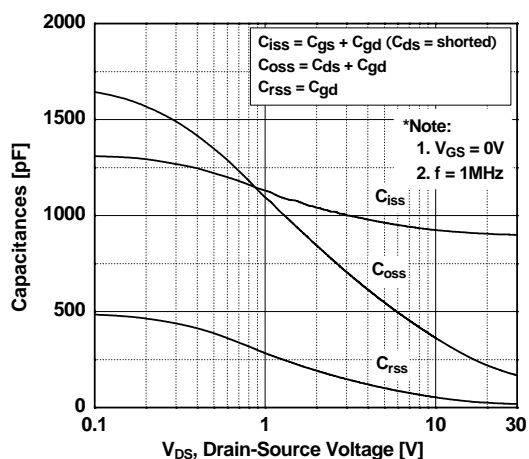
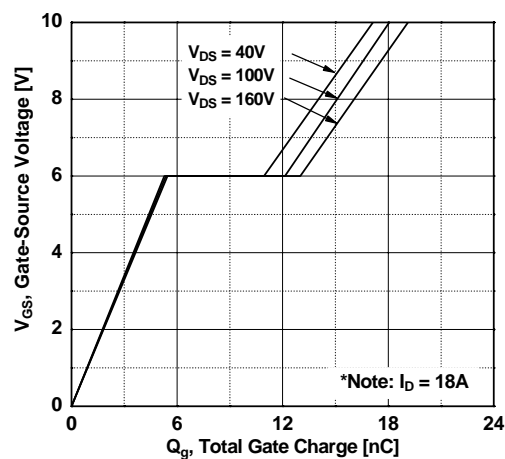
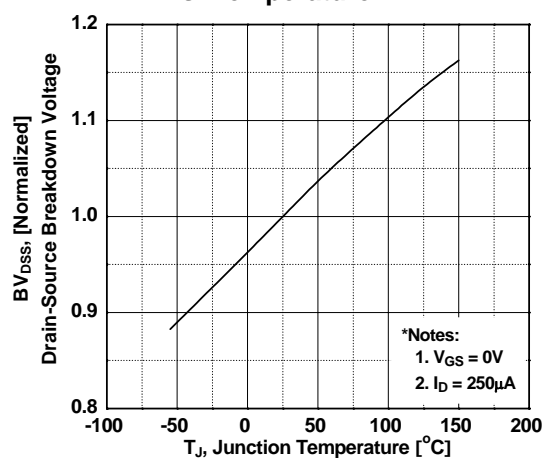


Figure 6. Gate Charge Characteristics

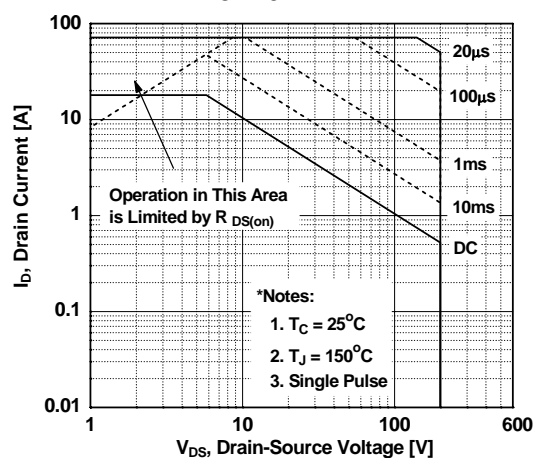


# Typical Performance Characteristics (Continued)

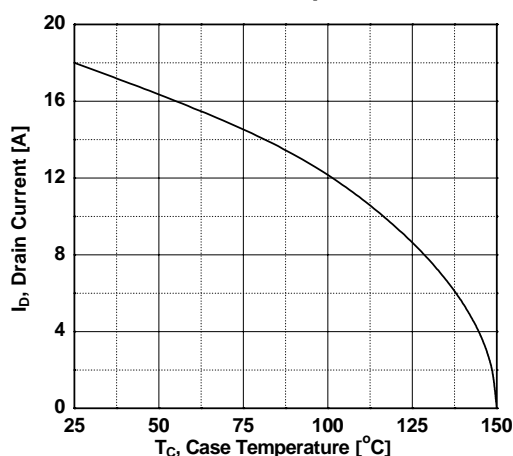
**Figure 7. Breakdown Voltage Variation vs. Temperature**



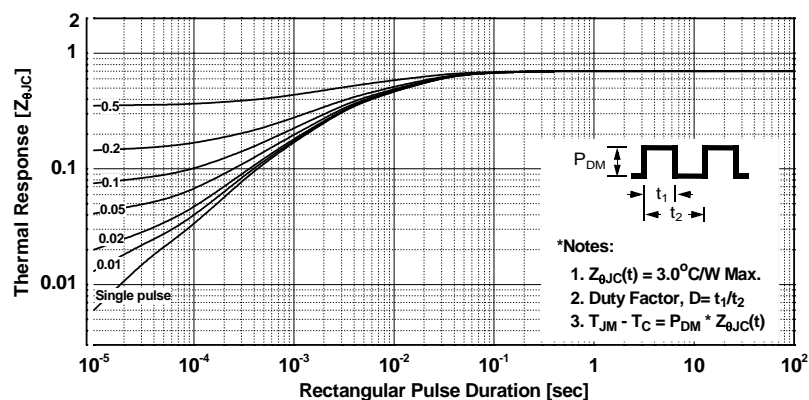
**Figure 8. Maximum Safe Operating Area - FDP18N20F**



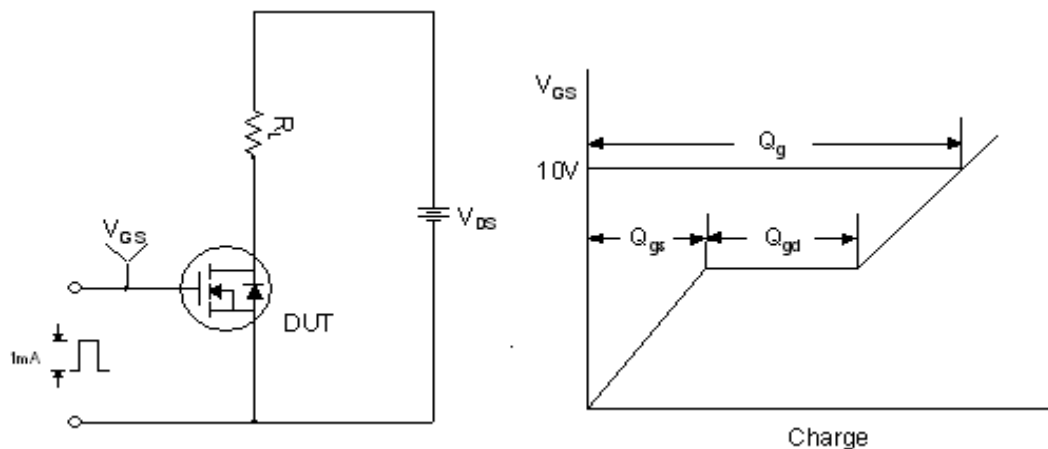
**Figure 9. Maximum Drain Current vs. Case Temperature**



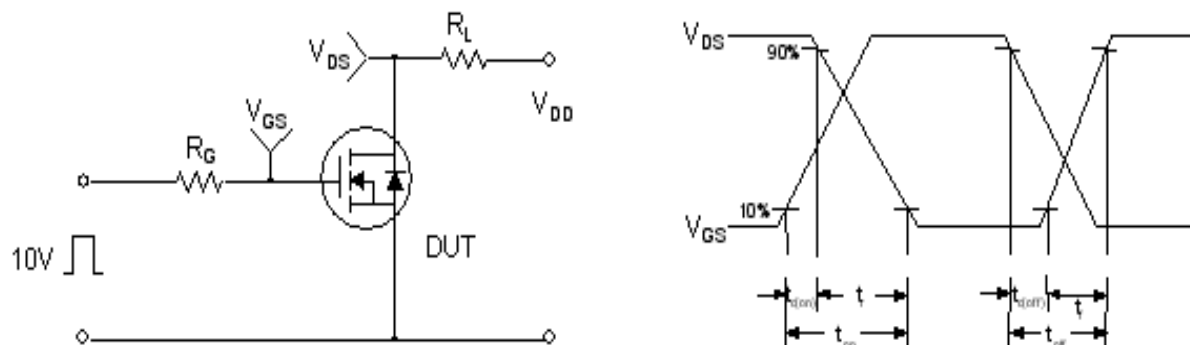
**Figure 10. Transient Thermal Response Curve - FDP18N20F**



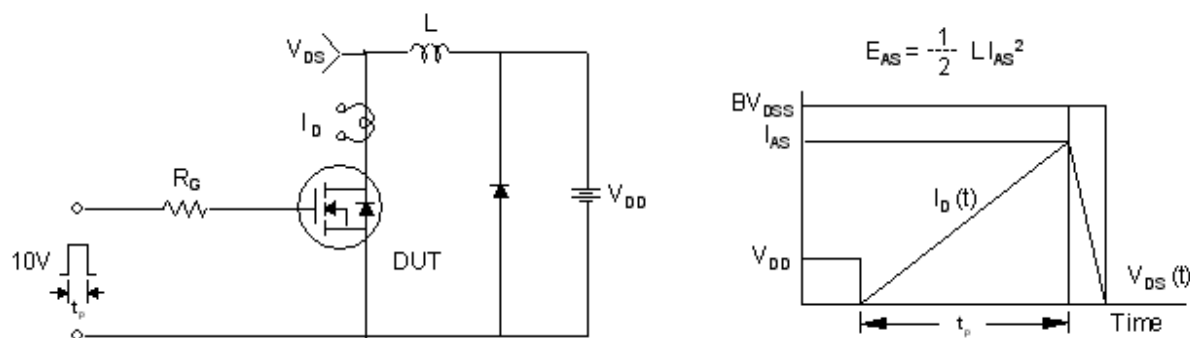
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



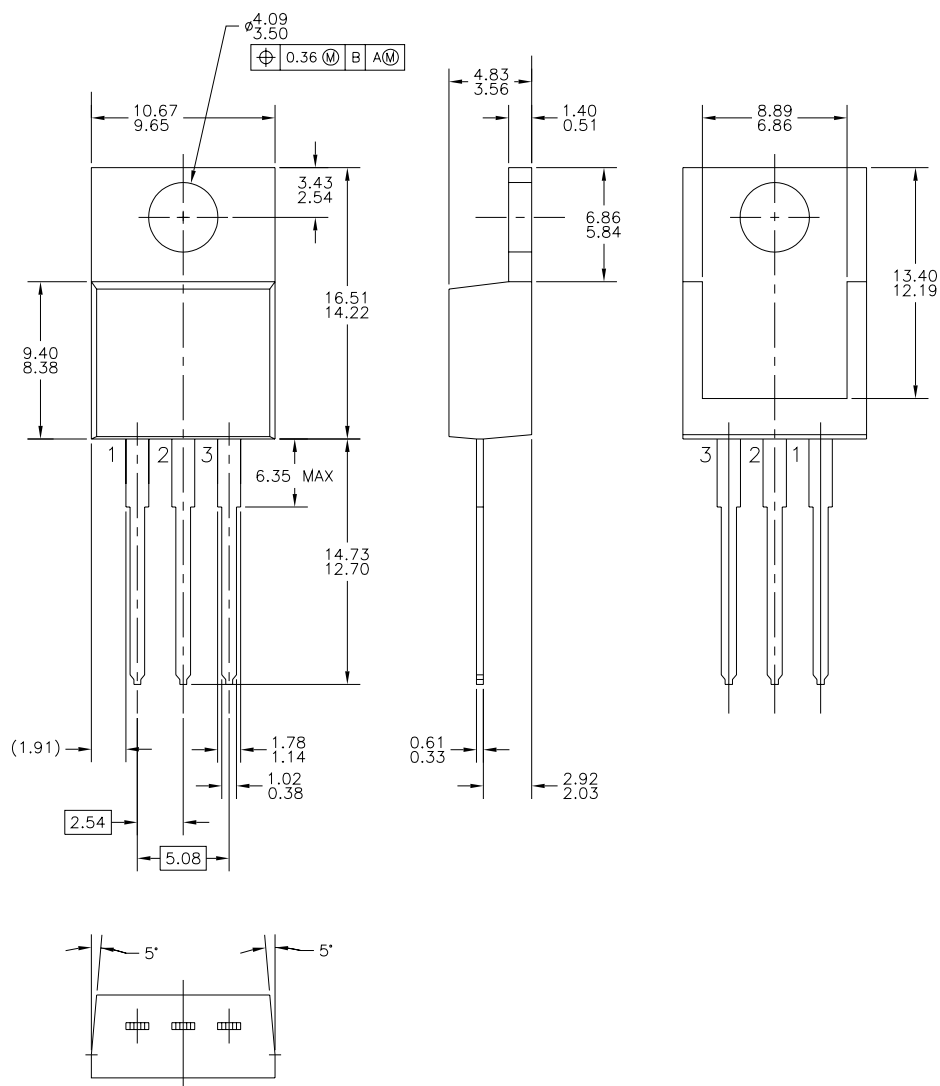
Unclamped Inductive Switching Test Circuit & Waveforms





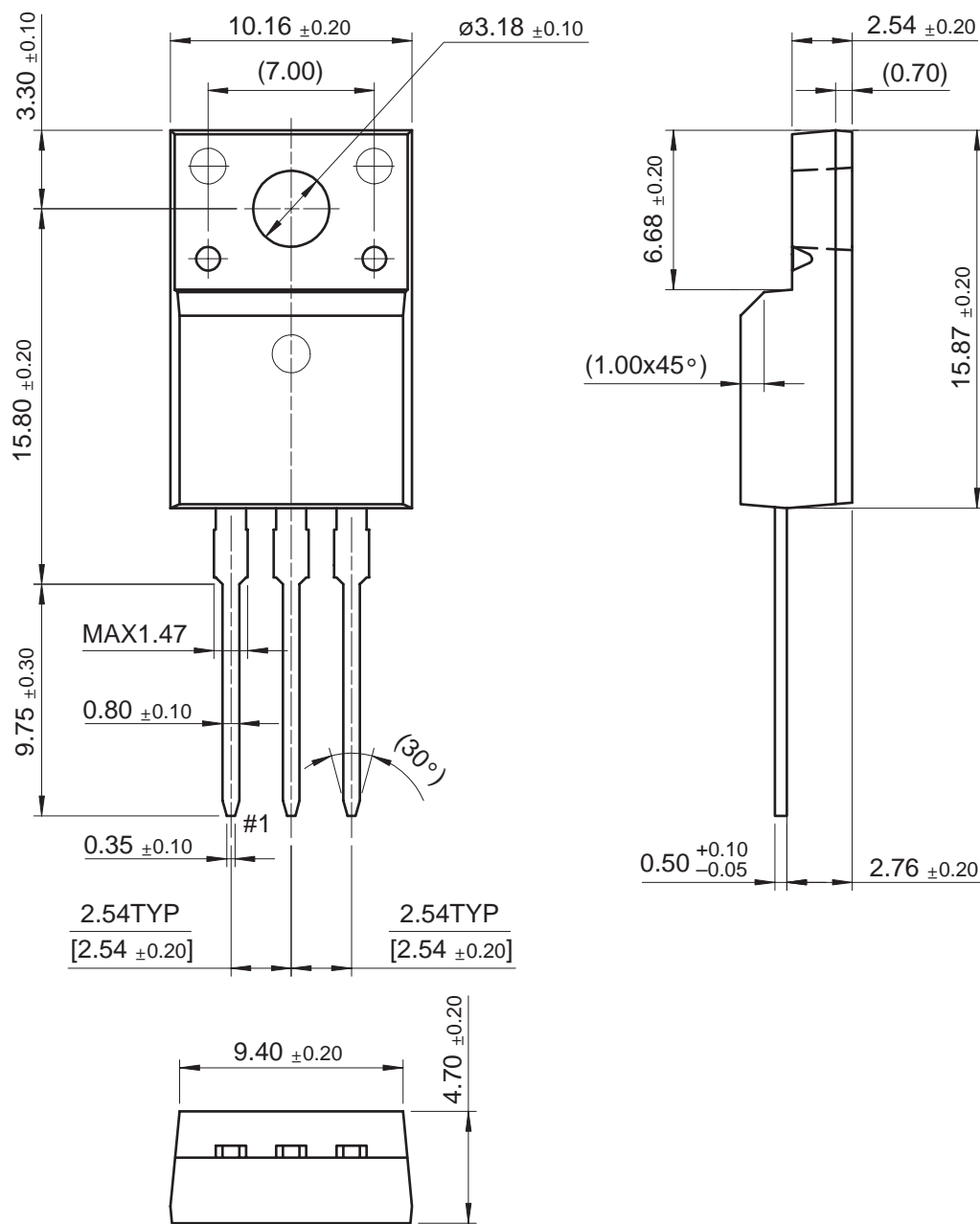
## Mechanical Dimensions

## TO-220



# Mechanical Dimensions

## TO-220F




Dimensions in Millimeters



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